

RESTING SITES OF STREAM-DWELLING GYRINIDS (COLEOPTERA) ¹

George W. Folkerts² and Lois A. Donovan³

It is generally assumed that whirligig beetles (Gyrinidae) spend most of their adult lives on the surface of the water. Although certain *Dineutus* dive beneath the surface when attacked or disturbed, their underwater sojourns are usually of short duration because their buoyancy necessitates that they hold on to a submerged object or continue to swim vigorously in order to remain submerged (Hatch, 1925). Members of the genera *Gyrinus* and *Gyretes* are smaller and more compact and seldom dive beneath the surface. Some of these may be incapable of breaking the surface tension or may be too buoyant to submerge.

Gyrinids which inhabit lakes, ponds, swamps, and other lentic habitats frequently rest by floating motionless on the surface. Since they shun areas of wave action, they use little energy in maintaining their position in the optimum microhabitat. Stream-dwelling forms, however, would be swept downstream unless some kind of compensatory action was taken. In streams, torrential portions, riffles, and other areas of swift current are avoided. Members of *Dineutus* typically frequent areas where the current is slowed by emergent logs, rocks or vegetation or inhabit the slower waters of pools and wide meanders. Many members of the genus *Gyrinus* frequent areas of slow current near the bank. Other species of *Gyrinus* and *Gyretes* prefer areas where the bank, the roots of stream-edge trees, or bank vegetation overhang the water creating a protected cove-like area with relatively slow current. Nevertheless,

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²Department of Zoology-Entomology, Auburn University, Auburn, Ala. 36830.

³Department of Biology, University of Southern Mississippi, Hattiesburg, Miss. 39341.

continuous swimming is necessary to maintain position relative to the bank, even in areas of slow current.

Stream-dwelling gyrinids are rheotrophic. The pattern of their swimming motions varies from erratic or circular, to a constant orientation against the current, but all undoubtedly expend the majority of swimming energy in locomotion against the current. Constant swimming throughout the adult life would result in a net distance of approximately 3,000 km covered per season. The energy required to swim this distance would seem to be excessive, especially since food does not appear to be abundant. It therefore seems likely that mechanisms other than constant swimming may be used to maintain the individuals in the same relative position in the stream.

During the past several years, we have had the opportunity to make a large number of observations on gyrinids inhabiting small and medium-sized streams in the mid-South. We have frequently noticed that more gyrinids were seen by looking backward than by looking ahead in the direction we were wading. Often, the first vigorous thrust with a dip-net into an area overhung by the bank or roots yields few or no *Gyrinus* or *Gyretes*, whereas subsequent attempts in exactly the same place may yield dozens of specimens. The reasons for these anomalous phenomena are obscure unless one closely scrutinizes the vegetation, detritus, and other emergent material near the edge in an area where specimens have been seen. If an observer remains motionless to prevent further disturbance of a group of rapidly gyrating *Gyrinus marginellus*, their movements are seen to become slower as the initial alarm reaction ceases. Within a few minutes they approach emergent twigs, roots, or leaves and climb out of the water. Often a number of individuals select the same site, the first ones to emerge sometimes climbing above the water surface to a height of 20 cm or more. Certain sites seem to be preferred over others, although differences between the sites may not be apparent. Both sheltered and exposed sites are occupied.

The smaller *Gyrinus* such as *G. marginellus* are adept at climbing. In one case, specimens were seen climbing up a smooth

barkless twig which emerged from the water at an angle less than 15° from vertical. Their ability to cling to surfaces is indicated by the fact that some individuals were clinging to the underside of the twig.

Individuals of several species may be found together on a resting site. We have noted *Gyrinus pachysomus* and *Gyretes iricolor* occupying the same sites. The latter species seems to be the more proficient climber. It also moves by short hops, a mode of locomotion not characteristic of *Gyrinus*. *Gyrinus pachysomus* is larger, heavier, and more rotund than *Gyretes* and seems to prefer sites which do not slope steeply from the water surface. In one instance we obtained 9 *G. pachysomus* by sweeping through an overhanging alder branch that was in contact with the water. Although many of the sites occupied were within a few cm of the bank, individuals were never observed resting on the bank itself.

Gyrinids resting on emergent sites do not seem to be alarmed by the approach of humans or objects. They either see very poorly or fail to react with alarm to visual stimuli. Movement of the object on which they are resting seldom elicits a response, perhaps because such movements may often be the result of current or wind. At one site we picked up a twig on which several *G. marginellus* were resting. Several seemed to shift slightly in an attempt to gain a firmer hold as the twig was lifted but none released its hold, jumped off, or changed its basic position on the twig. It was necessary to bang the twig forcibly on the edge of a dipnet in order to dislodge the individuals.

Frequently occupying resting sites may be characteristic of *Gyretes* and many of the stream-dwelling *Gyrinus*. Although specimens of *Dineutus* can occasionally be seen resting with part of the body on the edge of a leaf or twig, they seldom, if ever, completely leave the water surface. Perhaps their larger size and more flattened shape prevent them from being successful climbers.

We have not made a concerted effort to determine if species inhabiting bodies of water without current demonstrate similar resting behavior. *Gyrinus pachysomus*, which occurs in both lentic and lotic situations, occasionally climbs onto objects at the edges of ponds. *Gyrinus analis*, which is quite common in both flowing

and still-water habitats, seldom demonstrates this type of behavior. In streams it prefers areas farther from the bank than those occupied by *Gyretes* and most other *Gyrinus*. In such situations resting sites may not be common or stable and the resting habit may be undeveloped.

The functional significance of the habit of resting on emergent objects may be manifold. Obviously, less energy is expended than if the insects were continually swimming to maintain their position in the stream. Perhaps thermal regulation is involved as has been postulated as a function of basking in turtles. Heat gain necessary for subsequent activity may occur more rapidly at the higher temperatures that exist a few cm above the water surface. This behavior may also function to reduce the danger of predation by aquatic carnivores such as fish. In times of flood the ability to climb out of the water and cling to stream-edge or emergent materials may be critical to certain species, especially weak swimmers.

Clearly, at least some of the stream-dwelling gyrinids spend much of their time away from the water surface. Further investigation is necessary to determine the significance of this habit in the various species.

Collectors should be aware that, in many cases, groups of *Gyrinus* and *Gyretes* will not be observed on the water surface until they are washed from their resting sites by waves resulting from disturbance of the water.

LITERATURE CITED

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ABSTRACT.—A number of the smaller stream-dwelling gyrinids of the genera *Gyrinus* and *Gyretes* climb out of the water and cling to emergent materials. This behavior may function in energy conservation, in protection from predation, in thermal regulation, or as an escape from flood conditions. George W. Folkerts and Lois A. Donovan, Department of Zoology-Entomology, Auburn University, Auburn, Alabama 36830.

Descriptors: Coleoptera; Gyrinidae; *Gyrinus*; *Gyretes*; resting behavior; stream gyrinids.